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IMPACT OF ORGANIZATION PATTERNS IN LANDSCAPE ELEMENTS ON VISITOR LEGIBILTY

A study with reference to Sigiriya

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Abstract
Pattern recognition is important to understand and narrate the world around us. It is possible to develop a language, to communicate relation-ships between different patterns in surrounding environment to the user which could be used in reading the "legibility" of the space consisting of organization patterns of element. This study focuses on the impact of organizational landscape elements on aesthetic readability of the visitor. Kaplan's, information processing theory is used to study the legibility and the Bells' principles on the organization of elements are used to identify basic organizational patterns as; (1) the Spatial, (2) Structural, (3) the Order.

Effects of each of these patterns on legibility are studied on Sigiriya, a UNESCO heritage site in Sri Lanka and is carried out on two selected spaces where the users' readability is high on the main path. Space A, canter environment of char-bar in water garden, Space B: entry environment of Boulder garden. The results concluded that the similar level of presence of spatial, structural and order arrangements, with minimum variations in a space result in better readability of the visitor than in a space with higher deviation among organizations. And, people judged the space by giving least priority to the structural arrangement of elements.

Keywords: *Legibility; Landscape organization; Order; Structural; Spatial.*

1. Introduction

From the starting point of life, human began to explore, understand and gather information basically from the surrounding environment through five senses. Nevertheless, vision encounter 87% of human perception compared to other senses. Therefore, people grabbed more information from vision cantered identification of physical elements and their arrangements. Though, the landscape is composed of the same material, components, or even the same pattern, whilst the nature of perceiving the same landscape may rather different from each other. "Whatever our views, our cultural background or the values we attach to certain landscapes, we perceive them, at the most basic, structural level as patterns." (Bell, 1993). Thus, the way how people read the space, and to what extent do people continue reading the space is an important matter to be considered when space designing as it changes with the basic physical arrangement pattern of landscape. Hence Landscape design is a way of storytelling through element arrangements, composure of land-scape elements would act as a language to understand or to create meanings about space. Whilst only if the visitor able to read the space are viable to understand the story behind the space.

1.1 RESEARCH ISSUES

In the historical context ancient people had created spaces using different arrangement techniques of elements. They have invested more concern about the kind of information and the meaning which they want to interpret from individual space in the design. Finally, number of different spaces with distinct spatial characters and functioning's were all adjoined together to interpret a better meaning as a whole.

Comparatively at present, aesthetic quality of landscapes has been undervalued as they only concern about functional aspects, sur-face appearance and beauty but not the meaning of the space. There-fore,

there is a huge need of exploring ancient space arrangement techniques used for a better space designing in the present and for the future.

The regulation of level of readability of a space would affect for the preference and experience of the people. Due to the different tech-niques of space arrangement patterns, readability of people varied from place to place. Therefore, there would be a need of finding about different organization patterns of elements used in ancient historic designs.

- Do people really read the spaces through Landscape arrangement patterns?
- If so, then how people had referred Organization patterns in reading Landscapes?

1.2 OBJECTIVES AND CONTRIBUTION OF THE STUDY.

The main intention of the study is to explore how, the different arrangement patterns of landscape elements effects for the aesthetic read-ability of the visitor to maximize or minimize the quality of experience. Thereby how the spatial arrangement effects for the Unity and Harmony of the overall design is important. Hence, the results can be employed by space designers to conserve and preserve scenic quality in space.

The objectives will be,

- To identify how arrangement patterns in landscape effects read-ability of normal users.

The findings of the study will contribute to identification of techniques used in designing ancient spaces could be motivated and develop further and generate opportunity for other investigators to identify and research on other influential factors related to field of study. It would be a set of precedence information collection to understand basic organization patterns of landscape elements to maximize human legibility and associated human experience.

1.3 SCOPE AND LIMITATIONS

Sigiriya has been selected as the case study space and thereby two spaces were selected out of Sigiriya. Although Sigiriya is identified a cultural heritage site with international recognition, research only catered in finding how its latent landscape arrangement pattern affected man in process of reading the space through landscape organization principles despite of its other values, due to the limited of time factor.

One hypothesis was taken out and qualitative analysis process proceeded forward using Questionnaire, Interview and photo analysis methods of data collection using adequate measures to get qualitative samples of data. Due to the limitation of time factor sample selection reduces to 20 samples and case study limited to one place.

2. Literature Findings

2.1 ORGANIZATION PATTERNS OF LANDSCAPE ELEMENTS & LEGIBILITY.

2.1.1 Patterns in the landscape

Intentionally or involuntarily we would seek order out of disorder. We would have a habit of search for patterns which appear to sense in the information about the surrounding, and aesthetically affiliation of each part to the entire environment.

Pattern is an any frequently repetitive arrangements, specifically a design made as of recurring lines, shapes, or colours on a space. Pat-tern recognition is important to help us understand and relate to the world around us. We could have developed a language of description and analysis to communicate relationships between different patterns, the processes that change the landscape and our aesthetic and emotional responses to them. How it has been perceived and understood patterns also would depend very much on what is supposed to be looked for and why. For example, a cultural geographer, a farmer,

a physical planner, an explorer, an archaeologist or an army general are likely to describe the pattern of a landscape based on their own knowledge, experiences and what it would provide for them is its affordances, as one would use call them.

We could recognize relationship between arrangement of elements and what to be sensed in the actual space. Above elements would mean the components of environment which combines together to interpret a pattern. According to Bell (1993), when a person is to get involved with a new environment, they tend to investigate the structure and composition of a space as a sense of formal aesthetic response in the first sensory interaction or people search for patterns.

2.2 BASIC ELEMENTS OF VISUAL EXPRESSION.

Landscape design has been an organized collection of landscape elements. But, “In order to make sense of our surroundings we need to be able to separate each constituent part and then to identify it and to re-late it back to the whole scene.” (Bell, 1993) Every landscape element around us despite of man-made or natural, all made up as a combination of four basic elements called “Basic Building Blocks”. “In summary, point, line, plane and volume are the basic mass-space elements of visual expression. Every form of life that has been seen or visualized could be simplified to one of these elements or some combination of them.” (Bell, 1993)

2.3 ORGANIZATION OF BASIC ELEMENTS TO GENERATE PATTERNS.

Basic elements could be organized in different ways within a design to generate patterns with limitless variations. According to (Bell, 1993), in his book, he has talked about three ways of categorizing elements organization principles.

- Spatial - Nearness, Enclosure, Interlock, Continuity, Similarity, Figure and ground.
- Structural – Balance, Tension, Rhythm, Proportion, Scale.
- Ordering – Axis, Symmetry, Hierarchy, Datum, Transformation. (Bell, 1993)

2.4 LANDSCAPE LEGIBILITY AND PREFERENCE.

“Legere” is the Latin word for Legibility, which describe the meaning as ‘to read’ and means. It can be further described in two ways, a. “capable of being read or deciphered” or b. “capable of being discovered or understood” (Jerpåsen & Tveit, 2014).

Related to landscape, legibility would be “understanding the environment based on elements like landmarks that allow people to comprehend and function effectively” (CHENG, 2007) Clearness of the sur-rounding information has existed in landscape were remarks as "Legibility," by (Lynch, 2005). Relatively it affects to identify and systematize coherent patterns without any difficulty. Visual identification of pat-terns with easily noticeable symbols was legible. Relative to the city context districts, landmarks, pathways and edges are those of easily recognizable symbols of legibility according to Calvin. (Lynch, 2005).

Term legibility would differ according to archaeological context and urban design/ architectural context. (Dobson, 2010, p. 210) Former context it has been the “clarity of a readable past in the present”. Latter it has been a concept which precise “how difficult or easy it is to ‘read’ a particular landscape”. (Jerpåsen & Tveit, 2014) It also must have been a factor in comprehending people’s and landscape attachments to each other. (Drenthen, 2011; Jerpåsen & Tveit, 2014)

“It appears that people's preferences were based on three major aspects of the scenes they were inspecting. They prefer settings they can make sense out of, those they can comprehend with dispatch. They also prefer scenes that promise additional information.” (Kaplan & Wendt, n.d.) Accordingly, man would generously be responding to the landscapes with above exact characteristics. Then “legibility” and “Land-scape Quality” are the determinants of preference.

Information processing theory

Theory put forward by Rachel and Stephen Kaplan in 1989 related to Landscape visual preference. Human would tend first, to explore and then understand compositions of environment as fundamental reaction. Kaplan has suggested legibility as; understanding the immediate environment easily by means of elements, which would promote users' effective understanding and action of the space. (CHENG, 2007). Complexity, Mystery, Coherence and Legibility are the subjective variables of preference. (CHENG, 2007)

Kaplan has explained Coherence and identifiability as two aspects of information regarding legibility. "Identifiability involves making sense out of what is depicted." (Kaplan & Wendt, n.d.) If user tend to perceive what exactly designer concern to depict in the space of design, it is affiliated with the rule of "form follows function". (Kaplan & Wendt, n.d.)

Availability of Information	Needs	
	Understanding	Explore
Immediate (2D)	Coherence	Complexity
Inferred(3D)	Legibility	Mystery

Table 21; Kaplans Information Processing Framework

Identifiability would mainly concern of generating more readable landscapes. Similarly, Litton's (1972) has stated that "Vividness" or the clarity and differentiations of form and space could express the identifiability. (Staats, n.d.)

Source of Information	Degree of Inference	
	Less	More
Present Legibility	*Coherence*	*Identifiability*
Future information promised	*Complexity*	*Mystery*

Table 22; Stephan Kaplan's Table of Landscape Dimension.

Kaplan has characterized coherence as how well a scene "hangs together," According to Kaplan S.,1970 coherence has been the easiness in referring which constituent could hold the organization of a scene. "Making sense" of the organization of setting makes the space more coherent. It would have expressed the degree of spatial arrangement of landscape elements according to Kuiper (2000).

3. Theoretical framework

Lease disturbance to distinguish each character one by one in a text when reading is legibility, but it is not readability. Easiness in distinguishing single elements, sentences and an exclusive paragraph separately as a whole is readability. Hence legibility is an integral part of readability from the point of reading. (Wikipedia, n.d.). Although con-text is different from reading overall process is similar to reading.

According to Kaplan coherence would be the overall unity among visual arrangement of elements in a scene. And it can be likened with unity, as it is the factor which has afforded the sense that all the parts relate to each other in a scene. Simply the sense of order and organization of composition is coherence. Since Kaplan has stated about "the patterns of brightness, size, and texture" in a scene, theoretical framework has widened using more detailed organizational principles.

Coherence could be basically categorized in to three by means of how the elements would be organized in a space.

a. Relative spatial standing of each element and communication and interaction amongst each other. – Spatial Organization.

E.g. in the process of reading it can be express as "A collection of different words to create a meaningful sentence." Similarly, arrangement of individual elements in space would create and give the particular meaning of the space.

b. Way of how the different parts of design gets fit together or "The way in which the fragments of a system or object are organized" (Cambridge Dictionary)– Structural Organization. A collection of number of different meaningful sentences to create a whole para-graph.

c. Order in organizing landscape elements. - Order Organization. (Bell, 1993)

e.g. The way of how pleasing and understandable manner the story has been presented to the reader. Including justification, highlighting some parts of the sentence and font patterns arrangement to catch the reader.

3.1 RESEARCH DESIGN

Considering the Kaplans and bells principles author implement-ed a literature base as follows.

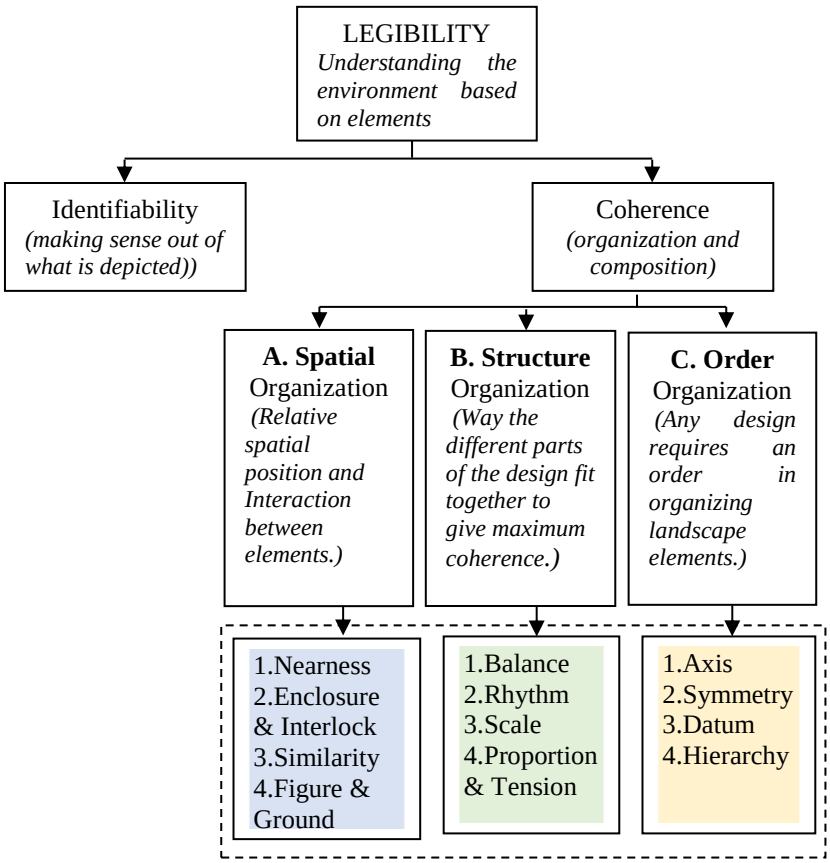


Table 23; Table complied by the Author according to Kaplan's Information processing Theory & Bell's organization principles.

It was understood that legibility could be analyse as a whole trough the three organization patterns. Comparative to the study author implement-ed a framework to understand the relative organization factor and there-by to understand the variation of factor in particular state for the ease of the study. (Kaymaz, 2012)

	Factor	Arrangement feature	Considering effect of the feature	Calculating Effect	Legibility
Spatial	Nearness	*Sight of elements as groups* ↑	*Chaotic Nature* ↓	*Nearness* ↑	% of reading
	Enclosure & Interlock	*Interlocking planes* ↑	*Feels space as a on unit* ↑	*Interlock & Enclosure* ↑	
		Connection with outside was interupted ↑	*Openness to views vistas* ↓		
	Similarity	*Minimum variation among elements* ↑	*Familarity for the context* ↑	*Similarity* ↑	

	Figure & Ground	*Level of contrast nature of forms* ↑	*Suddenly noticed scene or elements* ↑	*Figure & Ground* ↑	
Structural	Balance	*Balance nature of element composement* ↑	*Inbalance feeling due to spatial composition* ↓	*Balance* ↑	% of reading
	Rhythm	*Repetition of patterns* ↑	*feel of a rhythm* ↑	*Rhythm* ↑	
	Proportion	*Relative size of elemnts to each other* ↑	*Sense of harmony in place* ↑	*Wel Proportion* ↑	
	Scale & Tension	*Comfortbility of siz of elements considered to human size* ↑	*Feel of tension wit sizes ofelements related to position*	*comfortable Scale* ↑	
Order	Axis	*Guid the eye & symbolism of power* ↑	*Rigidness & sense of power* ↑	*Axis recognition* ↑	% of reading
	Symmetry	*Less formal or compatibility of shapes were eliminated* ↑	*Asymmetry* ↓	*Symmetryrecogn* ↑	
	Hierarchy	*Visual dominant showing pattern or function* ↑	*Identification of More dominant features or focus*	*Hierarchy* ↑	
	Datum	*Presence or absence reference element w controls & organize other elements* ↑	*Attention drews fi a specific point, pl or a object in the s* ↑	*Datum* ↑	

Table 24; Compiled by the Author according to the Bell's Organization Principles.

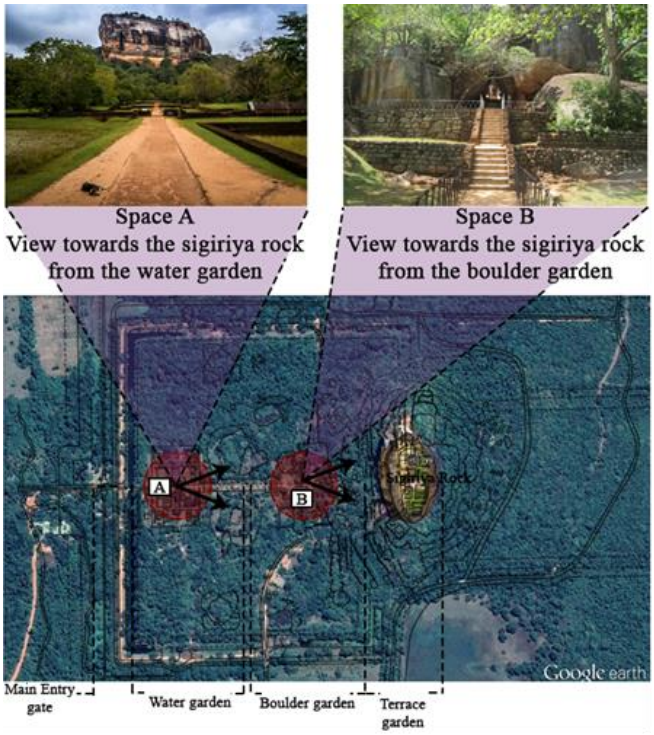
3.1 CASE STUDY

Sigiriya has been confirmed that it is a space with designed landscape in literature sources, and has a standard reputation about landscape characteristics in international context.

"It is an outstanding example of mid-first millennium planning mathematics, displaying a high degree of sensitivity to the incorporation of irregular, organic natural features in a plan based on an intricate square model" (Bandaranayke., 2005). A world heritage city with an exceptional combination of architecture, hydraulics an engineering, ur-ban planning, garden design and poetry and paintings goes back to 5th century. (Bandaranayke., 2005). Accordingly, Sigiriya selected as the case study space as its Landscape techniques runs back to ancient Sri Lankan context and still its arrangements valid for the appreciation.

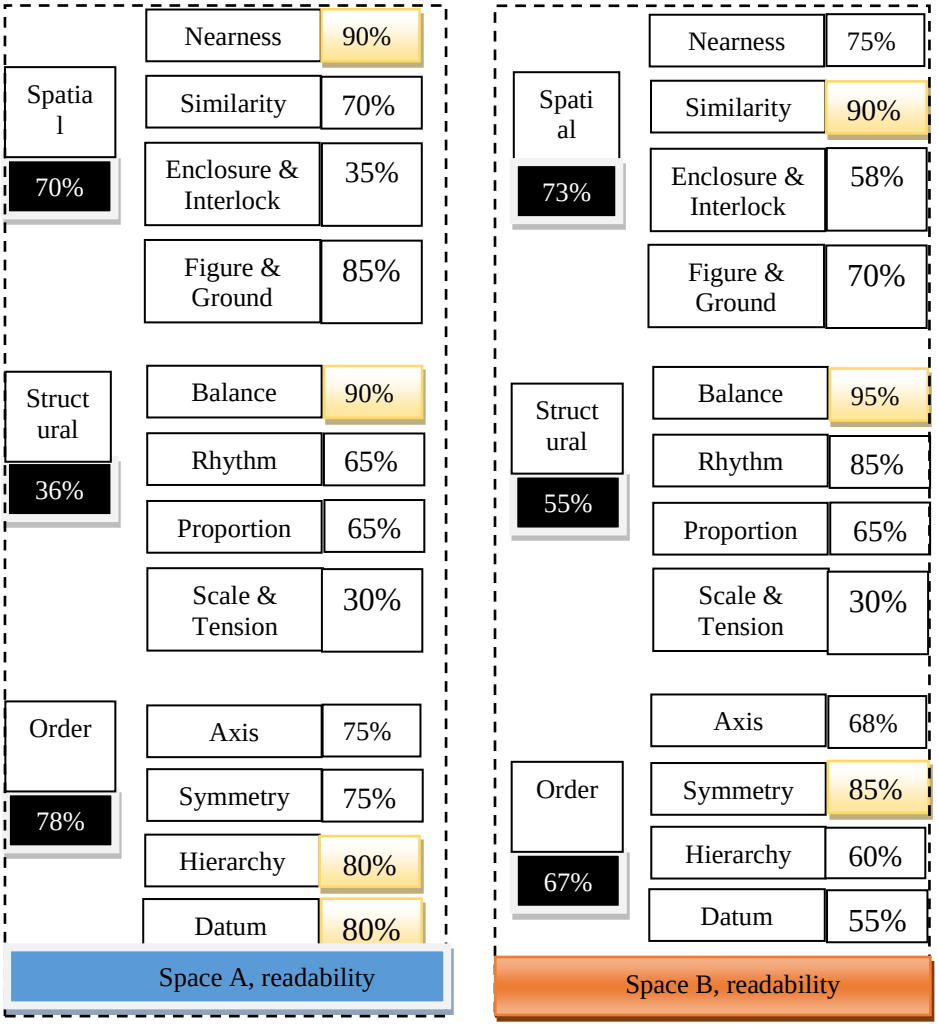
From Sigiriya, most critical highly readable two spaces were selected after interviews were,

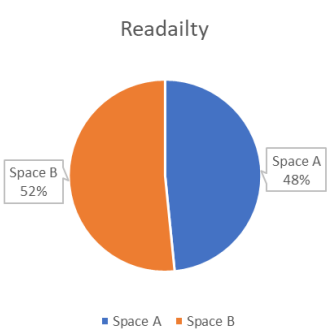
1. Space A. – Readability of space from the centre of the char-bhag along the pathway in Water garden complex.
2. Space B - Readability of space from entry environment of the Boulder garden complex.

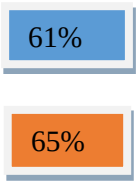


In this qualitative study, data were collected through interviews, questionnaires, onsite observations and selected 20 participants at each space.

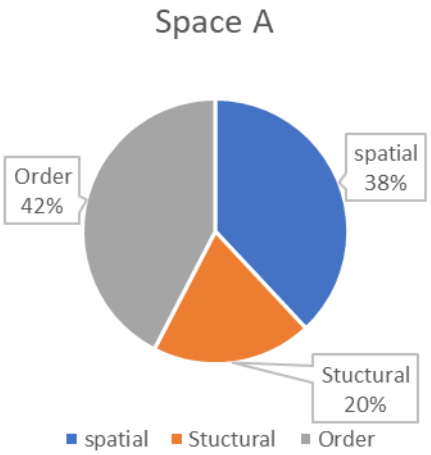
4. **Data presentation & discussion framework**

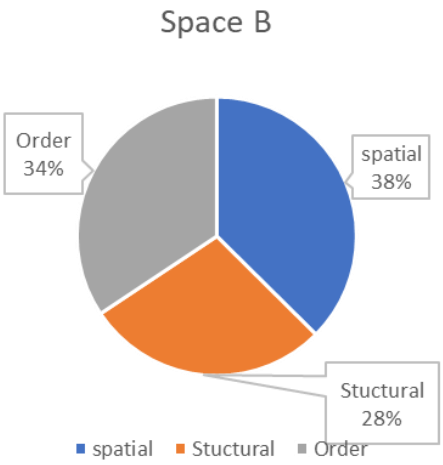


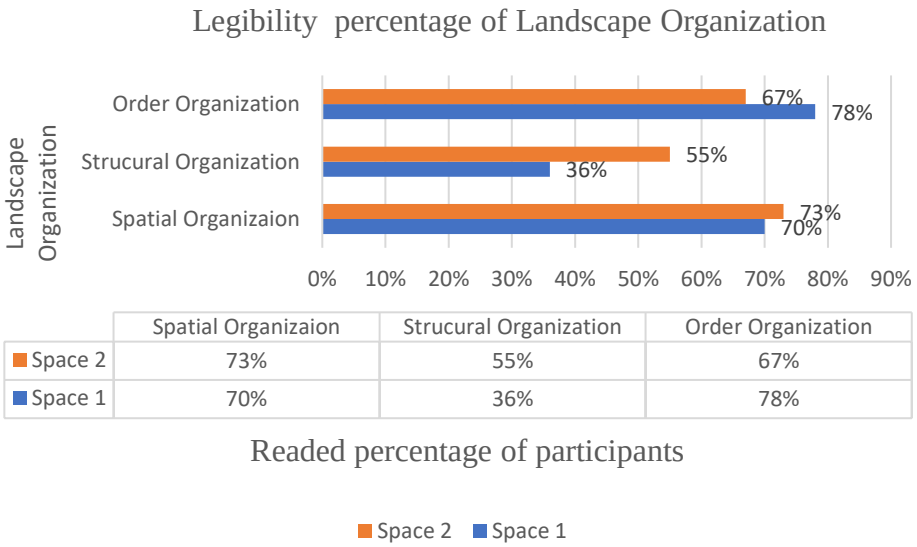




Both spaces together Landscape organization readability percentage of space B is 52% and space A, 48%. The results concluded that the readability of space B is higher than that of the space A.







Readable proportions of all three organizations in space B seems much similar to each other than in Space A.

Compared to the two spaces readability percentage of spatial Organization in space A is 70% and space two is 73%. Only 3% variation is visible. It seems that spatial readability of organization of space A as well as space B are almost similar to each other. It is further shown in the chart as well.

Compared to the two spaces readability percentage of structural Organization in space A is 36% while space B is 55%. Clear variation of 19% is visible.

Compared to the two spaces readability percentage of order Organization in space A is 78% and space two is 67%. There has been a slight variation of 11% visible.

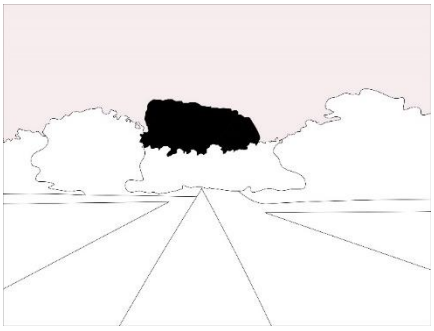


Figure 27;View towards Sigiriya from Space A

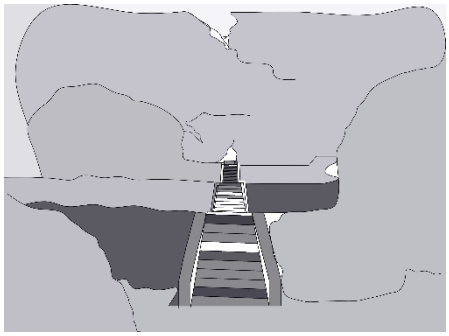


Figure 28;View towards Sigiriya from Space B.

5. Conclusion

Legibility consists of these three aspects and from the study its evident that where all three aspects are reasonably equal there's a better more chance of people reading or understanding/ enjoy space in a better manner where else regardless of differences if one aspect dominate from other two aspects, then proportionately the readability is low in the spaces. It was understood that legibility could be balanced as a whole when the three organization patterns, spatial, structural and order exists in balance and harmony with each other. Furthermore, from the three aspects it is evident from the study structural organizational aspect is the aspect, the smaller number of visitors tent to read. That means Balance ness, Rhythm, Proportion and Scale & tension of the arrangement's aspects were occupied a minor priority when reading the space.

But careful increasing certain aspects to limited or significant increment can give a special character to the space. These three can be manipulated to give a special character using the increase and decrease of related features. E.g.: Nearness factor is prominently affected for the increase of spatial readability in Space A. Nearness factor in space A is 90% while space B it is 75%, reason for the high readability in factor in space A compared to the space B is less chaotic nature due to the distance between view point and the sceneries is high and therefore characteristically elements can be identified as groups.

But with referent to the earlier matter it is important to highlight that increasing the structural organization as the diminishing other two aspects will not improve the situation. So, in designing landscape spaces it is pertinent that equal weight is given to three aspects and pay more attention to spatial and order aspect not to increase it but to enhance it in a way so that people will get the first reading the space more. And then start to understand the other two.

The hypothesis was proved from the research that people refer landscape organization patterns in reading a space. This study can be further extended with the accompany of more spaces with a larger population sample in the Sigiriya itself.

6. References

Bandaranayake., S. (2005). Sigiriya. City palace gardens monasteries paintings.

Bell, S. (1993). Elements of Visual Design in the Landscape. Second Edition. London and new york: Taylor & Francis e-Library, 2005.

Cheng, c.-k. (2007, may). Understanding visual preference for landscapes.an examination of the relationship between aesthatics and emotional bonding. 160.

Cooray, N. (n.d.). The Sigiriya Royal Gardens, Analysis of the Land-scape Architectonic Composition, 292.

Dictionary, C. (n.d.). Meaning of the Pattern in English Dictionary. .

Jerpåsen, G. B., & Tveit, M. S. (2014). Safeguarding Cultural Heritage in the Urban Fringe: The Role of Legibility. Landscape Re-search, 39(4), 433–454. https://doi.org/10.1080/01426397.2013.829808

Kaplan, S., & Wendt, J. S. (n.d.). Preference AND THE VISUAL EN-VIRONMENT: COMPLEXITY AND SOME Alternatives, 5.

Lynch, K. (2005). The image of the city (Nachdr.). Cambridge, Mass.: MIT PRESS.

Staats, D. H. (n.d.). Landscape assessment in the prairie states : design elements and landscape dimensions, 126.